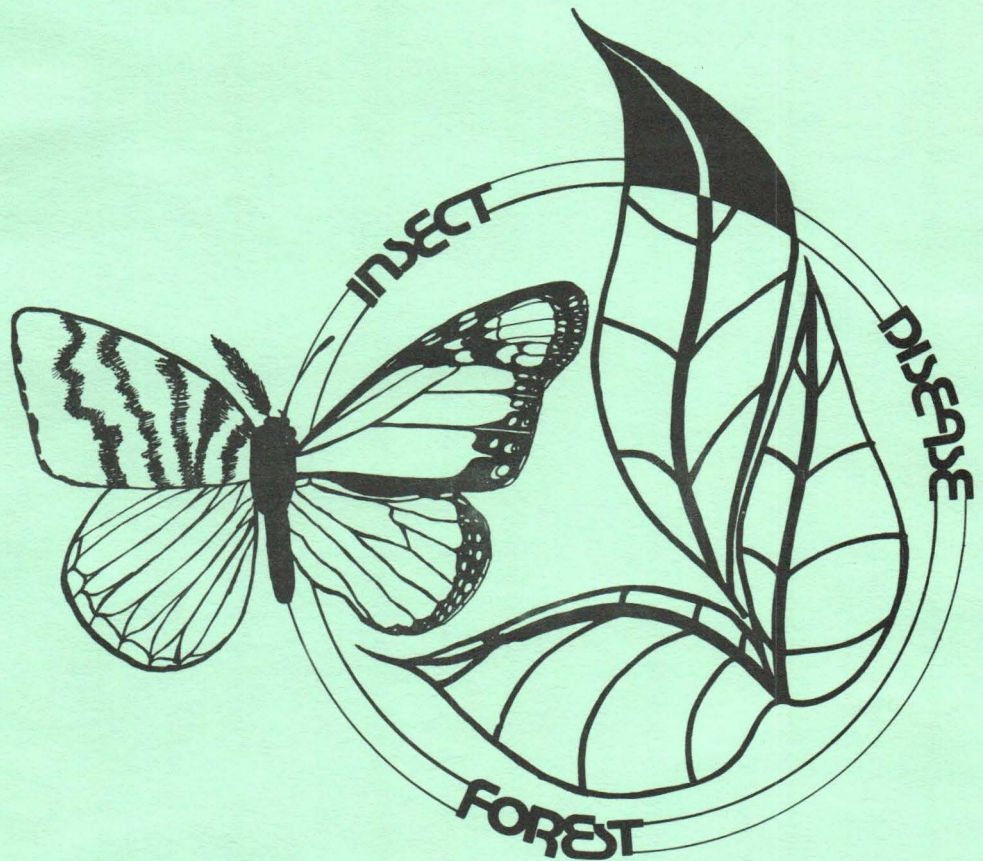


Northeastern Area, S&PF
USDA Forest Service
1992 Folwell Avenue
St. Paul, MN 55108

MISSOURI FOREST PEST REPORT 1984



**Missouri
Department of
CONSERVATION**



Forestry Division

MISSOURI FOREST PEST REPORT



Larry R. Gale, Director

Charles A. Purkett, Assistant Director

Jerry J. Presley, State Forester

Missouri Department of Conservation, Forestry Division
Box 180, Jefferson City, Missouri 65102

compiled by:

Ramon D. Gass, Forest Entomologist

Patricia E. Gowen, Ph.D., Forest Pathologist

Steve Gum, Graphic Artist

CONTENTS

Insects Observed in 1984 - Discussed in Report	1
Insects Observed in 1984 - Not Discussed in Report	2
Diseases Observed in 1984 - Discussed in Forest and Ornamental	
Tree Disease Section.....	3
Other Diseases in 1984.....	3
District Forest Map.....	6
Introduction.....	7
The Program.....	8
Conditions in Brief.....	9
Forest Insects.....	9
Forest Diseases.....	9a
Projects.....	10
Hardwood Defoliators.....	12
Hardwood Borers.....	16
Pine and Cedar Trunk Borers, Twig Borers and Defoliators.....	18
Forest and Ornamental Tree Diseases.....	21
Conclusion.....	28
Insect-Host List by County.....	29
Disease and Host List by County.....	30

PLATES

Forest Cover Map.....	11a
Life Stages of Gypsy Moth.....	13
Map - Gypsy Moth Finds.....	14
Map - Eastern Tent Caterpillar, Walnut Caterpillar, Kermes	
Scale, Tree Grasshopper.....	15
Map - Hardwood Borers.....	17

PLATES (Con't)

Map - Black Turpentine Beetle, Scale Insects, Gall Insects.....	19
Map - Pine Needle Scale, Juniper Sawfly, Pales Weevil, Nantucket Pine Tip Moth.....	20
Map - Diplodia Tip Blight.....	21
Map - Drought Damage.....	22
Map - Dutch Elm Disease.....	23
Map - Hypoxylon Canker of Oak.....	24
Map - Oak Decline.....	25
Map - Oak Wilt.....	26
Map - Winter Injury and Winter Kill (Hardwood Trees and Shrubs) Winter Burn and Winter Drying (Conifers).....	27

INSECTS OBSERVED IN 1984 - DISCUSSED IN REPORT

1. Aphids
2. Black Turpentine Beetle, Dendroctonus terebrans, (Oliv.)
3. Bronze Birch Borer, Agrilus anxius, (Gory)
4. Carpenterworm, Prionoxystus robiniae, (Peck)
5. Cottonwood Borer, Plectrodera scalator, (F.)
6. Cottonwood Leaf Beetle, Chrysomela scripta, (F.)
7. Cottonwood Twig Borer, Gypsononia haimbachiana, (Kft.)
8. Eastern Tent Caterpillar, Malacosoma americanum, (F.)
9. European Pine Sawfly, Neodiprion sertifer, (Geoff.)
10. Evergreen Bagworm, Thyridopteryx ephemeraeformis, (Haw.)
11. Fall Webworm, Hyphantria cunea, (Drury)
12. Gall Insects
13. Gypsy Moth, Porthetria dispar, (L.)
14. Kermes Scale, Kermes pubescens (Bogue)
15. Loblolly Pine Sawfly, Neodiprion taedae linearis
16. Nantucket Pine Tip Moth, Rhyacionia frustrana, (Comstock)
17. Pales Weevil, Hylobius pales, (Hbst.)
18. Pine Webworm, Tetralopha robustella, (Zell.)
19. Poplar Tent Maker, Ichthyura inclusa, (Hbn.)
20. Red Oak Borer, Enapholodes rufulus, (Haldeman)
21. Red Headed Pine Sawfly, Neodiprion leconte, (Fitch)
22. True Tree Grasshopper, Dendrotettix quercus, (Pack.)
23. Two-lined Chestnut Borer, Agrilus bilineatus, (Web.)
24. Walnut Caterpillar, Datana integerrima, (G. & P.)
25. White Pine Bark Aphid, Pineus strobi, (Htg.)

INSECTS OBSERVED IN 1984 - NOT DISCUSSED IN REPORT

1. Asiatic Oak Weevil, Cyrtepidomus castaneus, (Roelofs)
2. Boxelder Bug, Leptocoris trivittatus, (Say)
3. Elm Leaf Beetle, Pyrrhalta luteola, (Mueller)
4. Ips Beetles, Ips sp.
5. Lace Bug, Corythucha ciliata, (Say)
6. Obscure Scale, Melanaspis obscura, (Comstock)
7. Pine Needle Scale, Phaenacaspis pinifoliae, (Fitch)
8. Twig Girdler, Oncideres cingulata, (Say)
9. Walking Stick, Diapheromera ferromorata, (Say)
10. Wheel Bug, Arilus cristatus, (Linn.)

DISEASES OBSERVED IN 1984 - DISCUSSED IN FOREST

AND ORNAMENTAL TREE DISEASE SECTION

1. Diplodia Tip Blight, Diplodia pinea (Desm.) Kickx.
2. Drought Injury, weather
3. Dutch Elm Disease, Ceratocystis ulmi (Buism.) C. Moreau
4. Hypoxylon Canker of Oak, Hypoxylon atropunctatum (Schw. ex. Fr.) Cke.
5. Oak Decline, weather and various secondary agents
6. Oak Wilt, Ceratocystis fagacearum (Bretz) Hunt
7. Winter Burn, Drying and Injury, weather

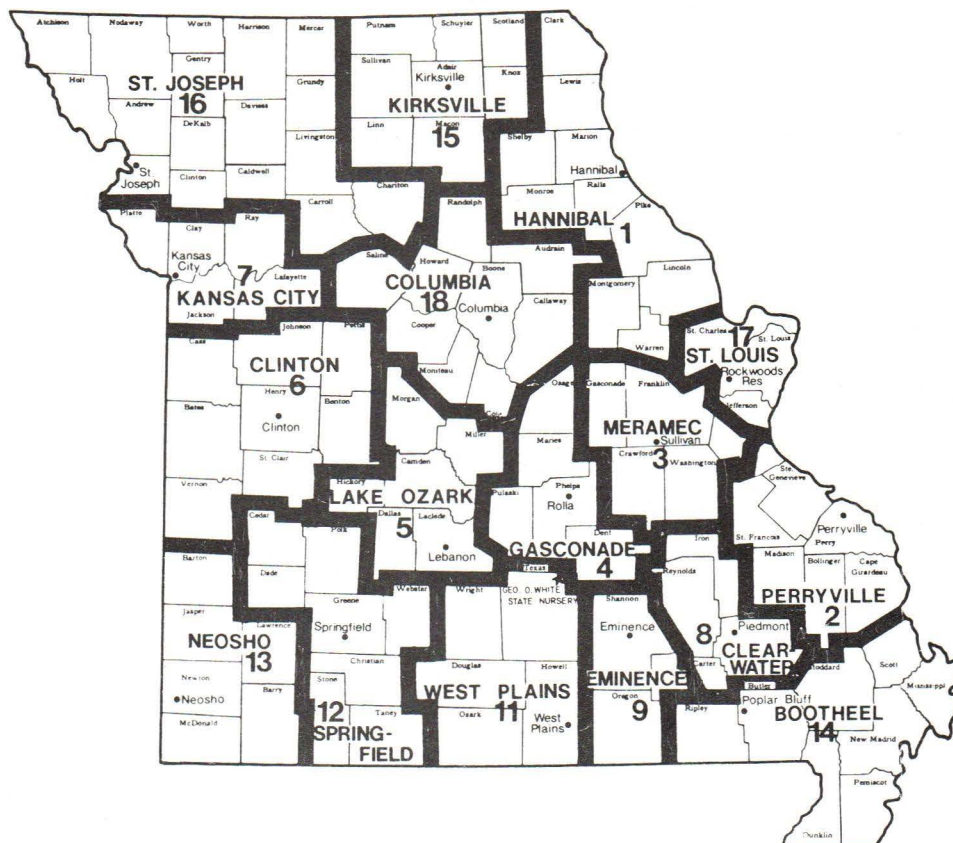
OTHER DISEASES OBSERVED IN 1984

1. Actinopelte Leaf Spot of Oak, Actinopelte dryina (Sacc.) Hoehn.
2. Air Pollution (Needle Tip Burn of E. White Pine), probably ozone
3. Anthracnose (Sycamore), Gnomonia platani Edg.
(Maple), Gloeosporium apocryptum E. & E.
(Oak), Gnomonia quercina Kleb.
(Ash), Gloeosporium aridum Ell. & Holw.
(Walnut), Gnomonia ^{leptostyla} ~~quercina~~ Kleb.
4. Apple Scab, Venturia inaequalis (Cke.) Wint. ap. Thum.
5. Armillaria Root Rot, Armillariella mellea (Vahl. ex. Fr.) Karst.
6. Ash Decline, unknown
7. Bacterial Wetwood of Elm, Erwinia nimipressuralis (Burr.) Winsl.
8. Bleeding Canker, Phytophthora cactorum (Leb. & Cohn) Schr.
9. Botryodiplodia Canker of Oak, Botryodiplodia ravenelii Sacc.
10. Boxwood Leaf Spot, Macrophoma sp.
11. Brown-Spot Needle Blight, Systremma acicola (Dearn) Wolf & Barbour
12. Bull's Eye Leaf Spot, Cristulariella pyramidalis Wat. & Marsh

13. Cedar-Apple Rust, Gymnosporangium juniperi-virginianae Schw.
14. Chlorosis (sweetgum), iron deficiency
(pin oak), iron deficiency
15. Chlorotic Dwarf, genetic-caused susceptibility and air pollution
16. Cytospora Canker of Willow, Cytospora chrysosperma (Pers.) F.
17. Dogwood Leaf Spot, Septoria cornicola Desm.
18. Dothistroma Needle Blight, Dothistroma pini Hulbarry
19. Eastern Gall Rust, Cronartium quercum (Berk.) Miyabe ex. Shirai f. sp. echinatae
20. Elm Phloem Necrosis, mycoplasma-like-object
21. Fireblight, Erwinia amylovora (Burr.) Winsl.
22. Frost Crack, weather
23. Frost Damage, weather
24. Fusarium Canker of Walnut, Fusarium sp.
25. Hail Damage, weather
26. Heat Scorch, weather
27. Herbicide Injury, herbicides
28. Ice, Heavy Snow and Wind, weather
29. Kabatina Blight, Kabatina juniperi Schneider & Arx
30. Lightning Injury, weather
31. Maple Decline, unknown
32. Maple Leaf Spot, Phyllosticta minima (Berk. & Curt.) Ell. & Ev.
33. Melampsora Leaf Rust of Cottonwood, Melampsora sp.
34. Naemacyclus Needlecast, Naemacyclus minor Butin
35. Nectria cinnabarina canker, Nectria cinnabarina Tode ex Fr.
36. Oak Leaf Blister, Taphrina caerulescens (Mont. & Desm.) Tul.
37. Peach Leaf Curl, Taphrina deformans (Berk.) Tul.
38. Pestalotia Blight of Yew, Pestalotia funerea Desm.

39. Phomopsis Blight, Phomopsis juniperovora Hahn
40. Pine Wilt Disease, Bursaphelenchus xylophilus (Steiner and Buhrer) Nickle
41. Powdery Mildew of Oak, unknown species
42. Pyrenochaeta Twig Blight of Oak, Pyrenochaeta minuta Carter
43. Quince Rust, Gymnosporangium clavipes C. & P.
44. Rhizosphaera Needlecast, Rhizosphaera Kalkhoffii Bub.
45. Sapsucker injury, Sphyrapticus varius (yellow-bellied sapsucker)
46. Steganosporium Canker of Maple, Steganosporium sp.
47. Sunscald Injury, weather
48. Tar Spot, Rhytisma acerinum Pers. ex Fr.
49. Verticillium Wilt, Verticillium dahliae Leb.
50. Witches' Broom of Hackberry, unknown

FORESTRY DISTRICTS



STATE FORESTER

Central Office
P.O. Box 180
(2901 North Ten Mile Dr.)
Jefferson City, MO 65102
314/751-4115

BOOTHEEL FOREST DISTRICT

Box 631 (116 S. Eighth St.)
Poplar Bluff, MO 63901
314-785-2846

CLEARWATER FOREST DISTRICT

Star Route 1, Box #1
Piedmont, Mo. 63957
314-223-4525

CLINTON FOREST DISTRICT

Box 147 (2010 S. Second)
Clinton, Mo. 64735
816-885-6981

COLUMBIA FOREST DISTRICT

1907 Hillcrest Drive
Columbia, Mo. 65201
314-449-3761

EMINENCE FOREST DISTRICT

Box "G" (Hwy. 19 North)
Eminence, MO 65466
314-226-3616

GASCONADE FOREST DISTRICT

Box 509 (Jct. E & Y)
Rolla, MO 65401
314-364-4221

HANNIBAL FOREST DISTRICT

Box 324
(Tower Plaza, 655 Clinic Rd.)
Hannibal, MO 63401
314-221-4805

KANSAS CITY FOREST DISTRICT

BURR OAK WOODS
P.O. Box 65 (1401 Park Road)
Blue Springs, Mo. 64015
816-228-3766

KIRKSVILLE FOREST DISTRICT

Box 291 (1201 N. Osteopathy)
Kirksville, MO 63501
816/665-4651

LAKE OZARK FOREST DISTRICT

Box 911 (Hwy. 5 South)
Lebanon, MO 65536
417/532-7612

MERAMEC FOREST DISTRICT

Box 248
(Jct. Bus. I-44 & 185 South)
Sullivan, MO 63080
314-468-4157

NEOSHO FOREST DISTRICT

Box 157 (Bus. 71 South)
Neosho, MO 64850
417/451-4158

PERRYVILLE FOREST DISTRICT

Box 152 (West Hwy. T)
Perryville, MO 63775
314-547-4537

SPRINGFIELD FOREST DISTRICT

1675 East Seminole, Suite 100
Springfield, MO 65804
417-881-5102

ST. JOSEPH FOREST DISTRICT

3408 Ashland
St. Joseph, MO 64506
816/233-3212

ST. LOUIS FOREST DISTRICT

ROCKWOODS RESERVATION
Route 1, Box 1599
Glencoe, Mo. 63038
314-458-2236

WEST PLAINS FOREST DISTRICT

Box 138 (618 Preacher Roe Blvd.)
West Plains, Mo. 65775
417-256-7161



Insect and Disease FACT SHEET

Forestry Division

INTRODUCTION

In introducing the 1984 Annual Forestry Pest Report, the first thing to come to mind is stress as applied to plants. It is a good word to describe the debilitating effect extreme environmental conditions have on trees. Winter of 1983-1984 was very severe thus stressing trees and shrubs. Trees and shrubs already stressed from winter went into summer which was generally very dry adding to stressful conditions for the plants.

Because of our present climatic conditions, hardwood trees continue to die in the forest in large numbers in south Missouri as well as many mature urban ornamental shade trees.

Although rainfall amounts were abundant this spring and this autumn, most parts of the state experienced very minimal moisture during the summer. We saw our first substantial rainfall in early September.

Site plays a big factor along with adequate moisture in determining how well a tree survives. Stress can be induced if the soil is too dry or too wet. These factors, among others, are considered when attempting to diagnose tree problems. Some tree species are able to withstand drought or other stresses better than others. In the Ozarks, white oak and shortleaf pine are able to withstand drought better than scarlet or black oak. As a result, where scarlet or black oak are the main stand component, clearcutting maybe in order to regenerate the stand or convert to shortleaf pine.

Department personnel were very busy servicing forest pest inquiries this year. The severe winter and drought and numerous insect and disease occurrences created problems for owners of forest trees, foresters, Christmas tree producers and anyone else involved with growing trees.

This was not a normal year. Spring was very wet and cool, summer was late in coming and autumn was exceptionally wet. Once summer began it turned very warm and dry.



Although gypsy moth defoliation was generally light in the northeastern United States in 1984, new spot infestations developed in Tennessee, Virginia, Oregon and Michigan. Missouri fared well again this summer. The U.S.D.A., A.P.H.I.S. agency and the Arkansas State Department of Agriculture lifted the gypsy moth quarantine on the Hardy, Arkansas area this spring. No male moths were trapped in this area for two summers and the area has been declared free of gypsy moths.

The droughts of 1980, 1983 and 1984 have served as triggering factors to predispose trees to attacks by the two-lined chestnut borer, root rot and canker diseases. Tree mortality increases as stress upon the trees increase.

Included in this report are pests that have caused damage to urban and forest trees during 1984. Some of the insects and diseases reduce the ornamental value of trees, while others cause log and lumber degrade and timber loss.

We serviced a great variety of inquiries involving insect and disease identification. Because more people are becoming aware of the Pest Management Program each year, our Forest District personnel and Forest Pest Management Specialists are receiving more inquiries.

Some insect populations were not as high this year as in previous years. In 1984 we saw different insect and disease problems. The 1984 drought generated many public inquiries regarding tree problems.

Many disease problems developed during the growing season due to a prolonged cold, wet spring. During this period as well as through the remainder of the summer, conditions were ideal for the development and spread of fungi which infect leaves, needles and stems. Various tree diseases continued to crop up during the entire growing season.

THE PROGRAM

In 1962, a cooperative program, the Forest Pest Control Program, was entered into with the U.S. Forest Service by the Forestry Division, Missouri Department of Conservation. Under the original agreement, the effort is designed to detect, evaluate and control forest insects and diseases on state and private land. Department Foresters and other personnel report occurrences of damaging insects and diseases. Forest Pest Management specialists coordinate the program.

Drought, disease, and insects can cause damage to trees and shrubs which may go unnoticed until mortality occurs. Tree losses occur on an annual basis in the forest from root, canker, and stem diseases, hardwood borers, pine cambial feeders, defoliating insects, and drought.

Trees under stress are vulnerable to attack by a host of canker fungi, root rot fungi, and insect borers. Some factors which stress trees are drought compacted soil, root disturbance, lightning strike, lack of nutrients, and wet or dry soil conditions to list just a few. Maintaining tree vigor is the most important consideration to insuring a long life.

CONDITIONS IN BRIEF

The growing season of 1984 was almost a carbon copy of 1983. This year's drought had a significant affect on tree vigor and survival, more than any other factor. Rainfall amounts were above normal until the end of May, then it turned dry for most of the state until early September. After September, rainfall amounts were more than adequate. Walnut production in 1984 was very spotty with some areas heavy and others with no nuts at all. Likewise, acorn production was light to moderate only in spots.

Winter drying and winter burn of conifer needles was very evident in the spring of 1984, when pines statewide exhibited browning of needles. The vast majority of trees recovered completely. Prolonged hot and dry weather from mid to late summer of 1984 stressed many oaks which had already suffered drought stress during previous years, with Armillaria root rot, Hypoxylon canker and oak decline being common problems as a result. Ornamental pines also exhibited dieback due to drought stress and secondary agents. Many Eastern white pines died as a direct result of the prolonged hot and dry weather, while many Austrian pines were afflicted with Diplodia tip blight and Scotch pines succumbed to pine wilt disease. Needlecast diseases of pine were present but not serious in the state.

FOREST INSECTS

Aphids - Huge amounts of honeydew on leaves and other surfaces revealed the presence of a variety of aphid species statewide in late spring and early summer of 1984.

Eastern Tent Caterpillar - Webs were absent from eastern black cherry this spring. Populations of this insect were very low.

European Pine Sawfly - This spring populations were light to moderate on Scotch and Mugho pines in St. Louis, Kansas City and in certain Christmas tree plantations around the state.

Fall Webworm - This insect occurred in moderate to heavy numbers on walnut trees and other hardwood species in southwest Missouri in 1984.

Gypsy Moth - During July, August and September 1984, thirteen male moths were recovered from traps in west and north St. Louis County, north Jefferson County and Ft. Leonard Wood in Pulaski County. Personnel of the State Department of Agriculture in cooperation with U.S.D.A., A.P.H.I.S. located and monitored over 6,356 traps. Other cooperators were the National Campers and Hikers Association, Department of Natural Resources, Parks and Historic Preservation Division, the University of Missouri, Entomology Department and John Grinstead at Ft. Leonard Wood.

Insect Galls - Various species of hardwoods were infested by gall insects. Most notably black walnut, pecan and hickory were hardest hit in the eastern half of the state.

Kermes Scale - Post oaks in the east central region of the state were attacked by the Kermes scale. Infestation was heavy in the St. Louis area and south of St. Louis.

Nantucket Pine Tip Moth - Probably because of the severe winter of 1983-1984 pupae were frozen in pine tips. Populations were very low in 1984.

Two-lined Chestnut Borer - This is a secondary borer that develops in stressed and dying oak trees. As drought continued, so did stressing and infestation of oak trees by this insect.

FOREST DISEASES

Actinopelte Leaf Spot - Affected pin, black, and Northern red oaks in three scattered counties. Though the disease was not widespread, it caused some defoliation of infected trees.

Anthracnose of Sycamore - Was a widespread problem of American sycamore in the spring. Infected trees did not seem to be as badly damaged by the disease as in recent years past.

Apple Scab - Many crabapples in urban areas were affected by apple scab in 1984. Some defoliation occurred, but the disease was not as extensive or seriously damaging as in 1983.

Botryodiplodia Canker of Oak - Pin, white, shingle and English oaks exhibited twig and stem cankers associated with a Botryodiplodia fungus. Most observed cases occurred in urban areas.

Brown-Spot Needle Blight - Affected some young ornamental Scotch pine, but remained mainly a problem of Scotch pine grown as Christmas trees.

Diplodia Tip Blight - Affected Austrian pine 25-30 years old and older and some large Scotch, Ponderosa and red pine. The disease was widespread and quite severe.

Dothistroma Needle Blight - Was a minor problem of Austrian pine in a few counties, mainly in central Missouri.

Drought Damage - Numerous hardwood and conifer trees were affected during the summer. Damage was widespread and severe.

Dutch Elm Disease - Appeared to be more prevalent on American elm (especially ornamental trees) than in past years.

Hypoxyton Canker of Oaks - Was associated with dieback of white, black, pin, willow and Northern red oaks around Missouri in 1984. The disease was widespread and lethal to many drought-stressed and declining oaks.

Maple Leaf Blister - Was widespread and alarmingly apparent in the spring on many ornamental sugar maples, but caused minor injury.

Naemacyclus Needlecast - Was a minor problem of Scotch pine in several counties.

Oak Decline - Northern red, white, post, pin, black and blackjack oaks exhibited oak decline in 30 counties and St. Louis City in 1984. Forest tree losses were estimated in the millions of board feet.

Oak Wilt - Northern red, black, white, shingle and pin oaks were affected by oak wilt in 31 counties and St. Louis City. The disease was more common and widespread in 1984 as compared to 1983.

Pine Wilt Disease - Was a common problem of drought-stressed Scotch pines around the state.

Rhizosphaera Needlecast - Was a serious problem of some Colorado blue and white spruce planted as ornamentals.

Sapsucker Injury - A number of hardwood and conifer trees were injured by the feeding activity of the yellow-bellied sapsucker. Trees grown as ornamentals were commonly attacked.

Winter Burn, Drying and Injury - Pine foliage was severely damaged around the state by extremely cold and windy weather during the winter of 1983-1984. Many ornamental trees and shrubs, especially mimosa were severely injured or killed by extreme winter conditions.

PROJECTS

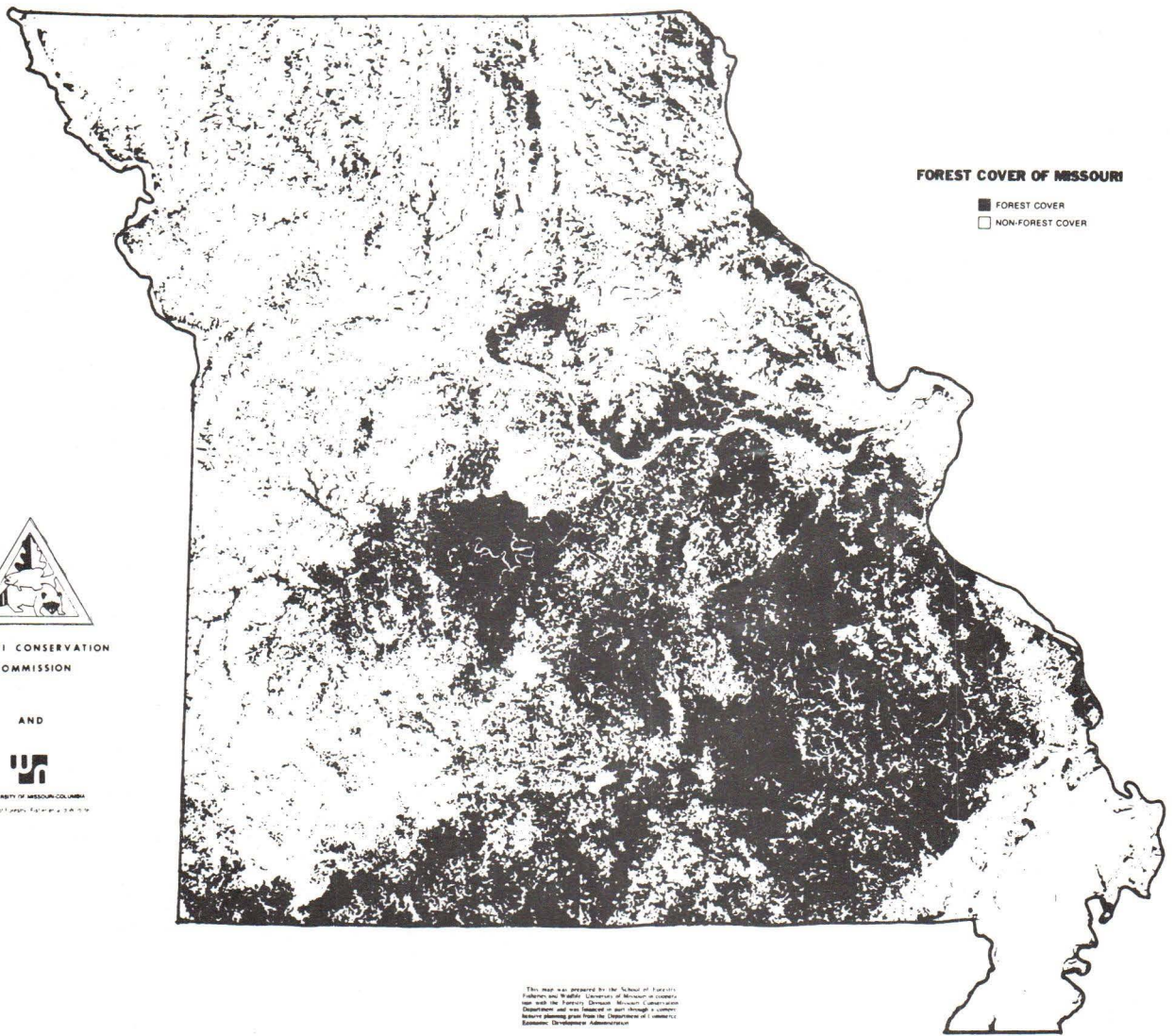
The cooperative team effort of Department Foresters and Forestry Division staff specialists resulted in a well-coordinated, successful Forest Pest Management Program again during 1984. Over 3,000 forest and shade tree requests were serviced statewide in 1984. The services of staff specialists were available to foresters and others. In February, March and May, six regional Pest Management sessions were held for all Department Foresters and personnel from other forestry related agencies. The meetings in February and March were held in St. Louis and Kansas City and were designed for arborists and others but were also attended by Department Foresters located in those two regions. Over 400 people attended these one-day meetings. Department Foresters and staff specialists serviced over 1,700 pest related telephone calls. Over 1,000 diagnoses were made for the state. No serious pest problems were found during visits to the George O. White State Forest Nursery.

Gass and Gowen conducted detection and evaluation surveys on the major insect and disease problems in 1984 on 5,000,000 acres. Reports were prepared and submitted to the U.S. Forest Service.

A total of five Forest Insect and Disease Status Reports (April through August) were prepared and sent to all Missouri Christmas Tree Producers, most Department personnel, and other individuals involved in tree care, totaling 1,000 copies per month.

Gowen attended the annual State Cooperators Meeting hosted by the U.S. Forest Service in St. Paul, Minnesota. She also attended the 1984 Annual Meeting of the American Phytopathology Society in Guelph, Canada.

Forest Pest Management Specialists and District Foresters presented technical sessions to arborists and at regional technical seminars and conferences.



FOREST COVER OF MISSOURI

■ FOREST COVER
□ NON-FOREST COVER



MISSOURI CONSERVATION
COMMISSION

AND



UNIVERSITY OF MISSOURI-COLUMBIA
School of Forestry, Extension and Service

This map was prepared by the School of Forestry,
University of Missouri-Columbia, in cooperation
with the Missouri Department of Conservation.
Data were obtained from the Department of
Conservation and were checked in part through a
cooperative planning project with the Department of
Economic Development and Administration.

HARDWOOD DEFOLIATORS

Gypsy Moth - During the summer of 1984 the gypsy moth defoliated one million acres of forest in the Northeast. Although defoliation was lower than in the previous three years, spot infestations of significant proportion developed or enlarged in West Virginia, Virginia, North Carolina, Michigan and Tennessee. Infestations developed in Oregon and California as well as Minneapolis, Minnesota. Personnel of the Missouri State Department of Agriculture trapped thirteen male moths in the St. Louis area and in Pulaski County. A male moth was recovered from a trap near the stables at Fort Leonard Wood in Pulaski County (John Grinstead). A male moth was trapped three miles south of Pacific in Jefferson County and eleven male moths were trapped in west and northwest St. Louis County (Missouri State Department of Agriculture). To date, no spot infestations have been discovered in Missouri. In 1984, 6,356 gypsy moth traps provided by U.S.D.A., A.P.H.I.S., were located and monitored by personnel of the Missouri State Department of Agriculture, Plant Industry Division and in cooperation with the U.S.D.A., Animal Plant Health Inspection Service. Other cooperating agencies were the Department of Natural Resources, State Parks and Historic Preservation, National Campers and Hikers Association, Corps of Engineers, and John Grinstead at Fort Leonard Wood. The Federal and State quarantines were lifted in the spring of 1984 from the Hardy, Arkansas area which was treated for a spot infestation in 1982.

The gypsy moth is not native to the United States, however, its life cycle does parallel that of a number of other native insects. In spring and early summer, larvae feed on a great variety of hardwood foliage causing tree mortality. With three repeated defoliations, tree mortality can occur. One defoliation can kill evergreen trees.

* * * * *

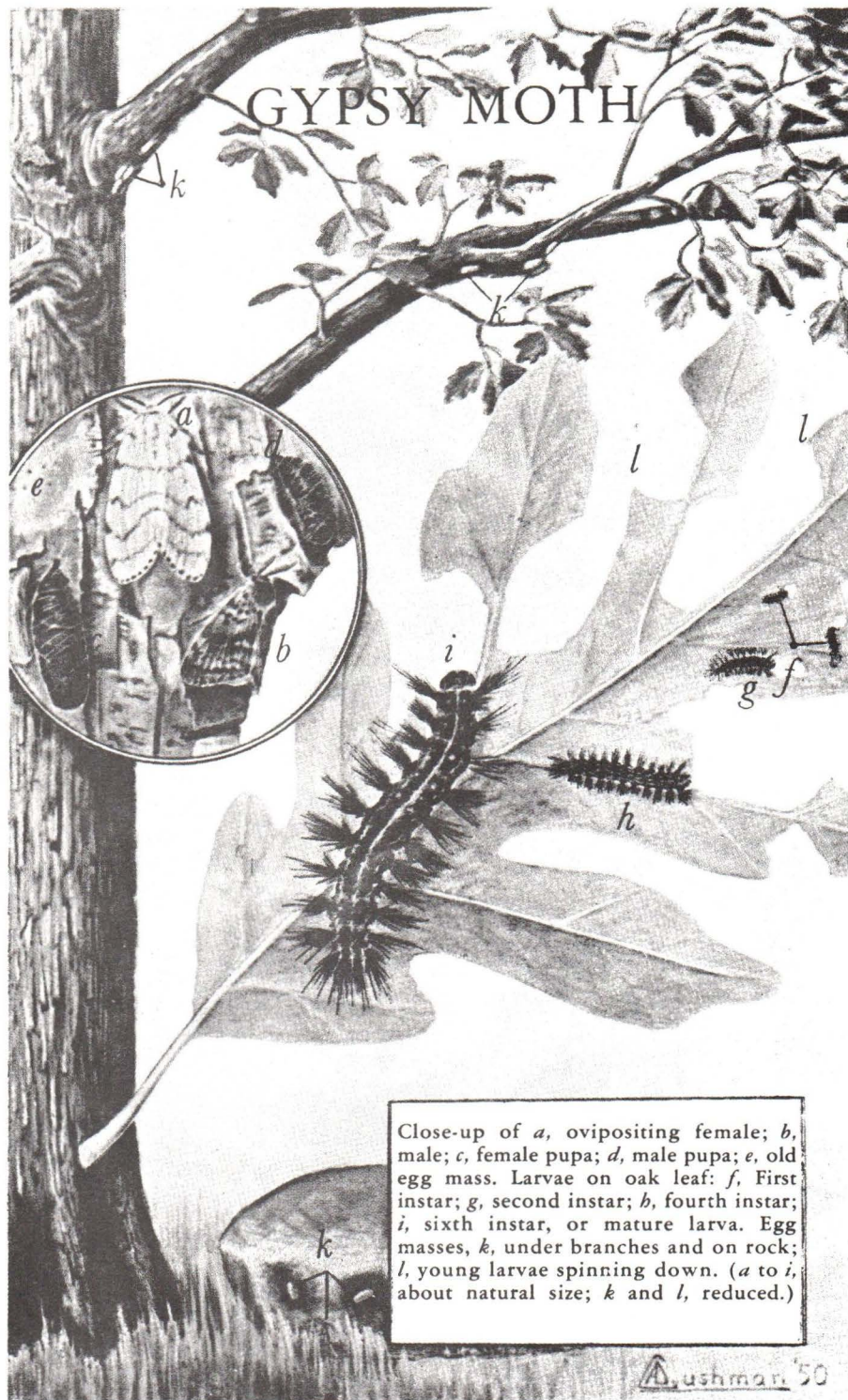
Gall Insects - Numerous reports were received regarding heavy gall infestations in 1984. Gall insects (flies, wasps and psyllid gall insects) are active in spring. These insects lay their eggs in succulent leaf or twig tissue where the swollen parts eventually develop. Galls commonly observed are on hickory, hackberry, and oak leaves. Elm and walnut leaves also have galls in early summer. Woody stem galls are common on the oaks.

Trend - Leaf and stem tissue was very succulent this year as a result of the abundant spring rains making egg-laying easier. If conditions are similar in the spring of 1985, we could see heavy gall formations again.

Suppression - No control was conducted for gall insects.

* * * * *

Aphids - One might observe that instead of the shingle oak skeletonizer this year we were bothered instead with aphids. This was the year of the aphids. Aphid activity was so great in late spring and early summer that its excretion, called honeydew, covered tops of cars, driveways and certainly leaf surfaces.



Aphid feeding causes stippling of the leaf surface and possibly some premature leaf fall. The honeydew eventually molds giving the leaf surface a black sooty appearance.

Suppression - No spraying was conducted to control aphid activity in our forests. Lady beetle populations and Neuropteran predators were present to feed on aphids.



* * * * *

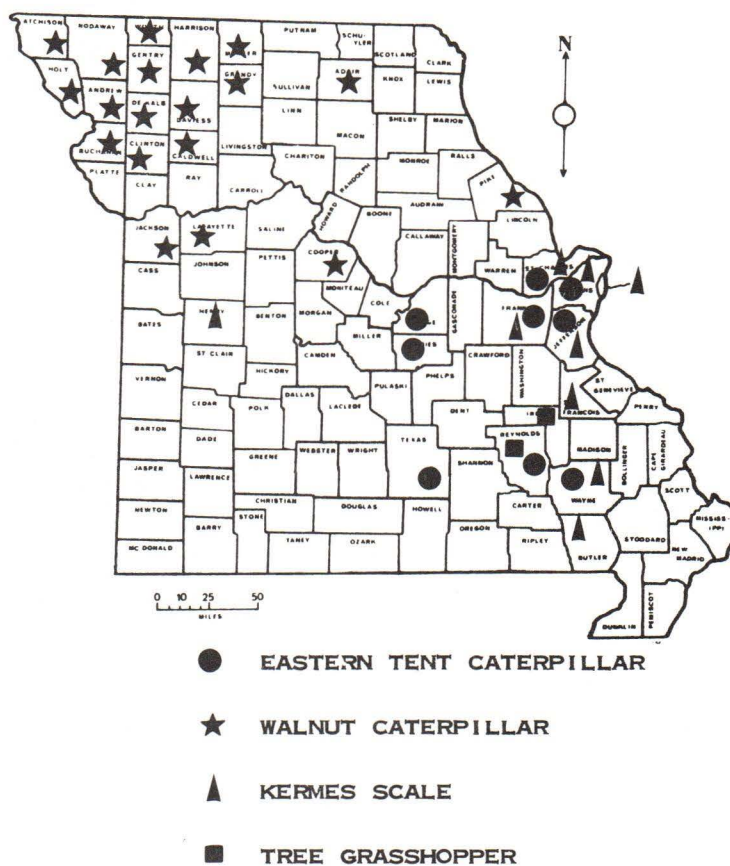
Trend - Populations should be low to moderate in 1985.

-14-

Eastern Tent Caterpillar - Populations were very low during the spring of 1984. Spring was very cold and wet with leaf emergence being much later than insect egg hatch.

Trend - Populations should be low again in 1985.

Suppression - No control work was necessary.



* * * * *

Fall Webworm - Populations were moderate to heavy in southwest Missouri in 1984. Infestation of black walnut, pecan, hickory, persimmon and redbud was common. The remainder of the state had low to medium levels of infestations on the same tree species.

Trend - Populations should be moderate to heavy again in 1985.

Suppression - Various walnut and pecan growers sprayed their trees to control this insect.

Walnut Caterpillar - Populations were light to moderate over the state on black walnut and hickory. Leaf feeding begins in July and ends in September on black walnut and hickory. Other Datana species fed on red oak, post oak and smooth sumac.

Trend - Populations in 1985 will be light in most areas of the state.

Suppression - A number of nut growers sprayed their trees to prevent infestations with approved insecticides.

* * * * *

True Tree Grasshopper - This tree leaf feeding grasshopper caused light to moderate defoliation this year in Iron and Reynolds Counties. Its preferred hosts are white oak, red oak, hickory and flowering dogwood. Feeding produces a lacy appearance to infested foliage. It is a forest insect and suppression was not necessary.

* * * * *

HARDWOOD BORERS

The Carpenterworm and Red Oak Borer - and other living hardwood tree borers as part of our endemic, indigenous borer populations continue to infest hardwood trees in forested areas of the state. Hardwood borers are a major problem on many hardwood trees in urban areas.

Trend - Borer infestation will continue in hardwood trees occupying poorer sites. Estimated dollar loss to the hardwood borer complex amounts to \$2,000,000 annually through lumber degrade and ornamental tree loss.

Suppression - Selective tree harvest, sanitation harvest and stand conversion was conducted in forested areas over the state. Some shade tree owners controlled borer infestations on high value trees.

* * * * *

The Cottonwood Twig Borer, Cottonwood Borer, Cottonwood Leaf Beetle and Poplar Tent Maker - continue to infest cottonwood where it grows. Borer damage is greater in trees growing on poor sites. Defoliation by the Poplar Tent Maker occurs almost everywhere cottonwood grows.

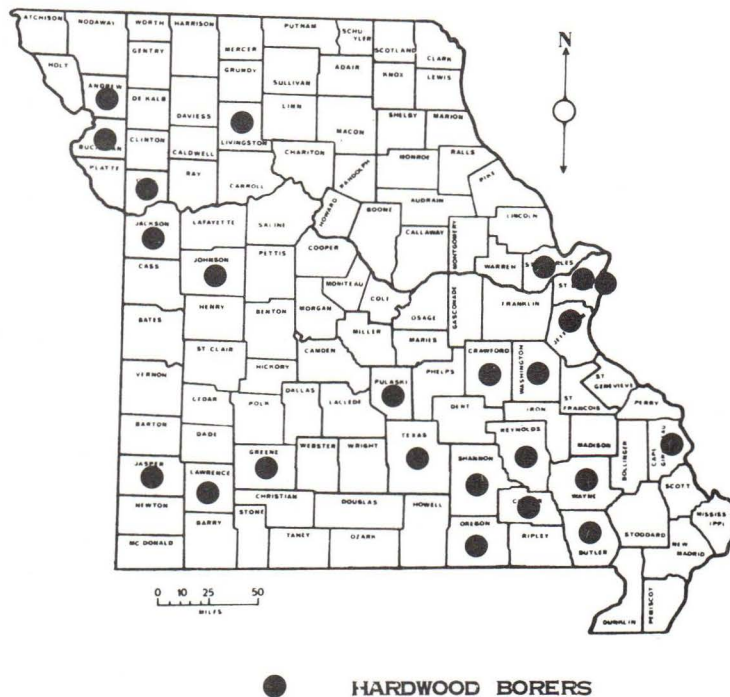
Trend - No increase in infestation is anticipated in 1985.

Suppression - No control was conducted for any of these insects in 1984. If populations build, recommended controls will be used.

Two-lined Chestnut Borer - This insect is not a primary attacker of live healthy trees. It is a secondary attacker of stressed black and scarlet oak as well as shingle oak. It plays a role along with various root rots and Hypoxylon canker in finally killing stressed oak trees. Beginning in 1978, and through 1980, moisture was a limiting factor to tree growth, triggering attacks by the two-lined chestnut borer and root rots. In 1983 and this year 1984, drought conditions prevailed from late June through September over most of the state. As a result of the affects of drought, many more oak trees were lost. Other tree stressing factors are late frosts, poor site and spring defoliating insects.

Trend - Without the adequate summer rainfall, oak trees will continue to be stressed. Oak trees will continue to die as long as rainfall is deficient during the most critical growing period. Tree mortality will continue for several years as a result of the dry period from 1976 to present.

Suppression - Forest managers should recognize drought hazard sites. These areas should be managed in such a manner as to pay attention to species composition and alternatives to even-aged management and conversion to shortleaf pine where hardwood basal area is too low. On these marginal hardwood sites the entomological and pathological rotation should be used rather than a standard rotation age.



PINE AND CEDAR TRUNK BORERS, TWIG BORERS AND DEFOLIATORS

Nantucket Pine Tip Moth - Populations over the state collapsed in 1984. This insect normally infests shortleaf and Scotch pine, however, the severe winter of 1983-1984 caused populations to collapse.

Trend - Populations during 1985 should be very low.

Suppression - No control work was necessary during 1984.

* * * * *

Loblolly Pine Sawfly - This sawfly was observed in Laclede county in 1984. Populations were down from 1983.

Trend - We expect to see low levels of this insect in 1985.

Suppression - No control work was necessary in 1984.

* * * * *

European Pine Sawfly - This insect was reported from the Kansas City, Kirksville, and St. Louis areas feeding on Scotch and Mugho pines. Infestation was light to moderate.

Trend - Population levels will remain low to medium in 1985.

Suppression - Some tree and shrub owners had their plants sprayed with an insecticide.

* * * * *

Redheaded Pine Sawfly - This pine defoliator was reported from two counties in 1984. It is a defoliator of Shortleaf pine in the summer but will also feed on Scotch and Virginia pines. Populations were at a low level this year.

Trend - Populations will remain at a low level for 1985.

Suppression - No control work was done in 1984.

* * * * *

White Pine Bark Aphid - Populations were at a low level over the state. Very few reports were submitted on this insect.

Trend - Populations should be light in 1985.

Suppression - No control work was necessary in 1984.

Trend - Beetle populations will develop where shortleaf pine trees are disturbed either naturally or artificially.

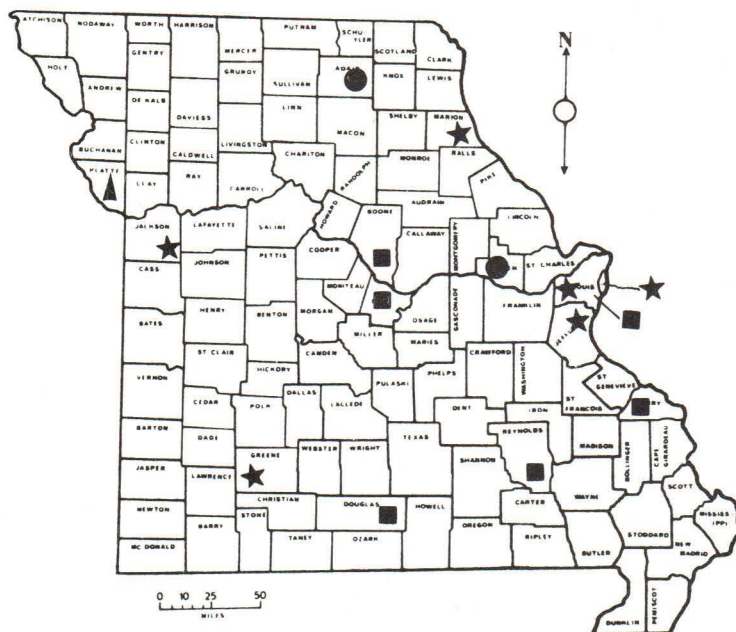
Suppression - Where feasible attacked trees are removed as timber cutting progresses in timber sale areas.

* * * * *

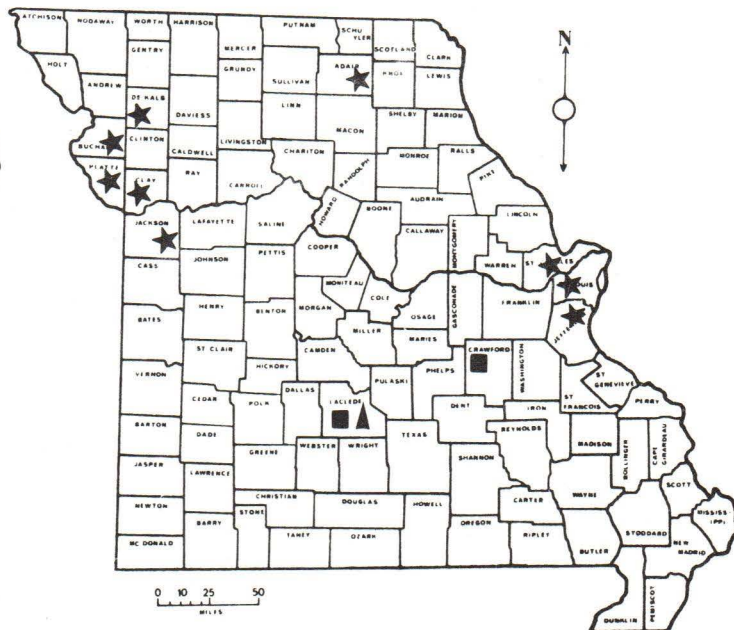
Pales Weevil - This insect was not a serious problem in Christmas tree plantations in 1984. We received one report from a grower this year.

Trend - Populations should be very light in 1985.

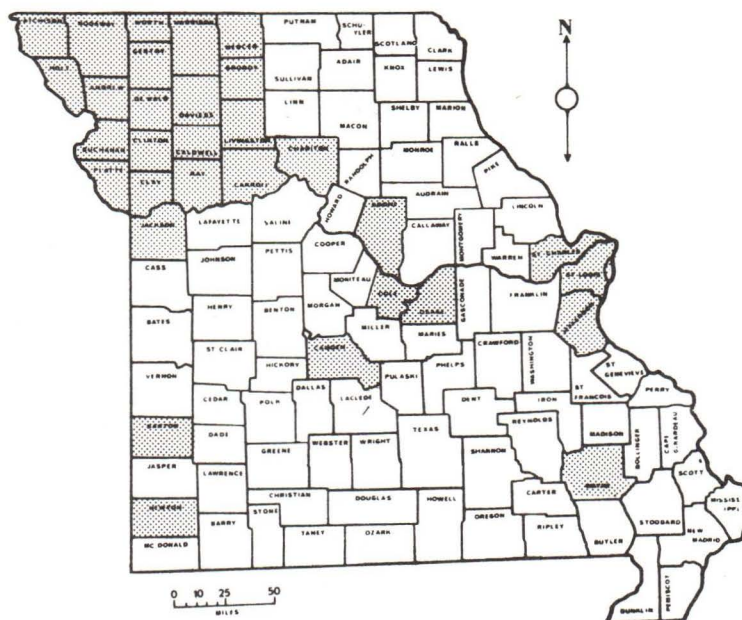
Suppression - No suppression was required this year. Our standard control recommendation is to spray stumps produced during the latest Christmas with Thiodan and diesel fuel in March of the following year. Unless growers already have the problem, they usually don't take control measures to prevent possible weevil buildups for the following year.



- ★ PINE NEEDLE SCALE
- ▲ JUNIPER SAWFLY
- PALES WEEVIL
- NANTUCKET PINE TIP MOTH



- ★ EUROPEAN PINE SAWFLY
- ▲ LOBLOLLY PINE SAWFLY
- REDHEADED PINE SAWFLY



DIPLODIA TIP BLIGHT

FOREST AND ORNAMENTAL TREE DISEASES

Diplodia Tip Blight - Was widespread and quite severe on Austrian pine 25 - 30 years old and older and some large Scotch, Ponderosa and red pine. Most trees affected were ornamentals in urban areas.

Trend - Diplodia tip blight will continue to be a major problem of mature Austrian pine and other large pines, especially those which have endured prolonged drought stress from 1976-1984 in various areas of the state.

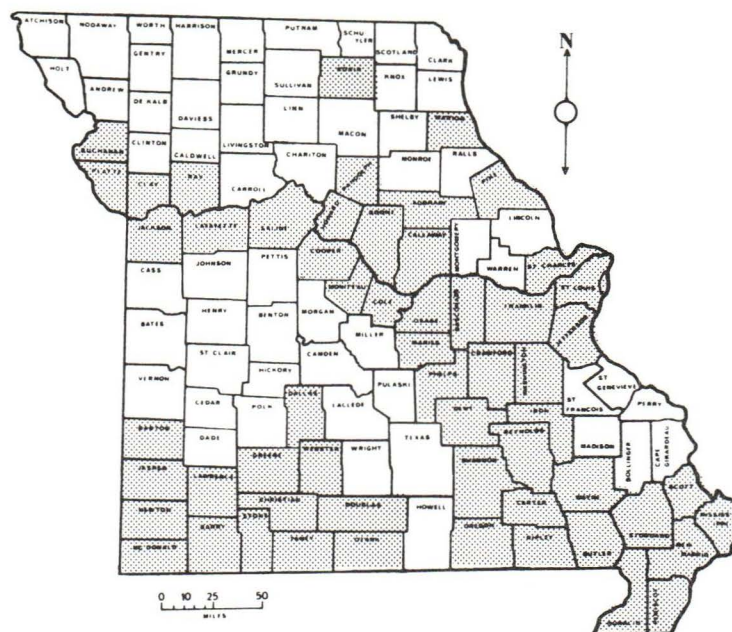
Suppression - Application of Bordeaux mixture 8-8-100 at bud break (middle to end of April) and one week later, has provided good control of the disease.

* * * * *

Drought Damage - Numerous hardwood and conifer trees were damaged, stressed or killed by extended hot and dry weather during the summer of 1984. Many oaks, already drought-stressed over many areas of the state from 1976-1984, exhibited decline symptoms in addition to Hypoxylon canker, Armillaria root rot and infestation by the two-lined chestnut borer. Drought-stressed Scotch pine were frequently found positive for pine wilt disease. Many Eastern white pines died as a direct result of the extended hot and dry weather.

Trend - Drought-stressed trees, especially the oaks and pines, can be expected to exhibit mortality over the course of the next several years as a result of the decline process.

Suppression - dead and dying oaks and pines were removed to help prevent a build-up of Hypoxylon inoculum and spread of the pine wood nematode and other pests.

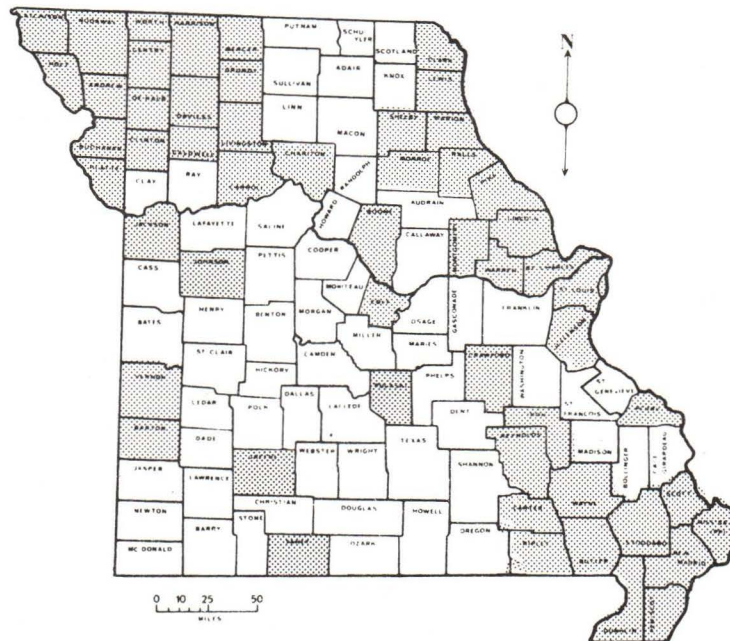


DROUGHT DAMAGE

Dutch Elm Disease - Appeared to be more prevalent on American elm in 1984 than in recent years past. In 1983, 52 counties and St. Louis City had a Dutch elm disease problem, while 54 counties and St. Louis City observed the disease in 1984. The same general distribution of the disease occurred in 1984 as in 1983.

Trend - Dutch elm disease is endemic in Missouri. It will continue to afflict American elms throughout the state. Few American elms remain in Missouri's forests.

Suppression - Removal and destruction of dead elms is employed to help limit spread of the disease. Chemical injections are used to treat individual high value elms, but are not employed on a widescale basis.



DUTCH ELM DISEASE

Hypoxyylon Canker of Oak - Was associated with the dieback of white, black, pin, willow and Northern red oaks around Missouri. Stromata of Hypoxyylon atropunctatum were often observed on both dying and dead forest and shade trees.

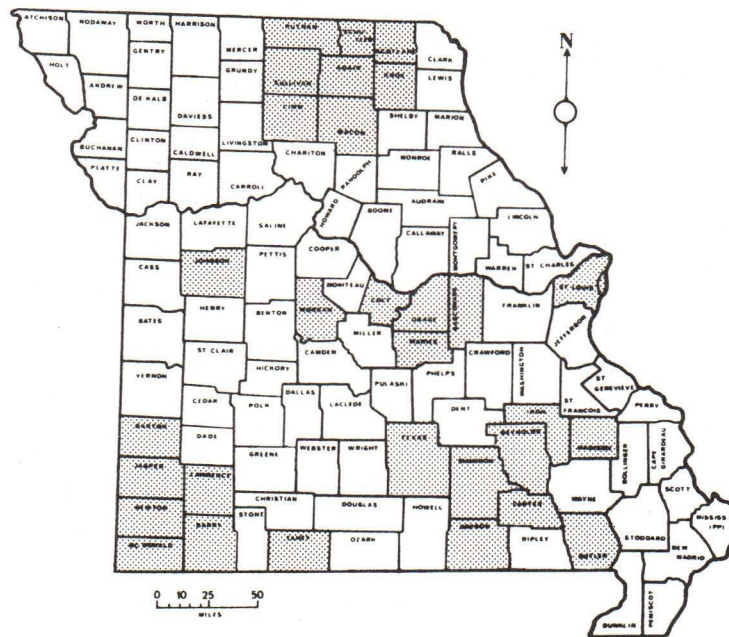
Suppression - Dead and dying oaks with Hypoxylon canker were removed to help limit disease spread.

HYPOXYLON CANKER OF OAK

Oak Decline - Northern red oak was most often subject to oak decline. Other oak species affected were: white, post, pin, black and blackjack oak. Oak decline is believed to be a drought-induced condition, with secondary agents such as Hypoxylon canker, Armillaria root rot and the two-lined chestnut borer contributing to mortality. In 1984, 30 counties and St. Louis City had an oak decline problem. Estimates for losses in the forest in 1984 were in the millions of board feet.

Trend - Oak decline should continue to be a problem for the next several years, even if adequate rainfall should occur during the summer of 1985. Should summer conditions be extremely hot and dry again in 1985, oak mortality can be expected to increase.

Suppression - Dead and dying oaks were often removed and used for firewood or salvaged for timber.

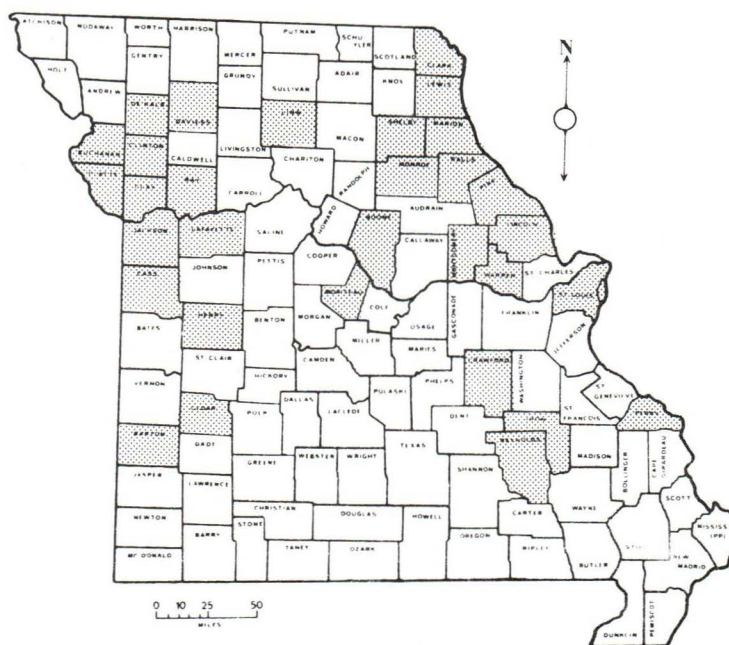


OAK DECLINE

Oak Wilt - Northern red, black, white, pin and shingle oaks were affected by oak wilt in 1984. Oak wilt appeared to be more prevalent than in recent years past and more widespread, with the disease observed in 31 counties and St. Louis City in 1984 as compared to 21 counties in 1983.

Trend - Oak wilt is endemic in Missouri. Scattered losses of ornamental and forest trees can be expected to occur in the future. No large scale mortality is expected to result from oak wilt in the future.

Suppression - Dead and dying oaks are removed on an individual basis.



OAK WILT

CONCLUSION

The drought of 1983 and 1984 stressed most of our trees and shrubs. This stress was evident in the forests in south Missouri and in the large **Urban** areas. The hot dry weather caused extensive leaf scorch and was **responsible** for some insect and disease problems.

We completed our third season with the Integrated Pest Management Program (IPM) with the University of Missouri - Columbia. This multi-state reporting program has been developed to collect and computerize pest occurrence data for most economic plant pests in the state. Forestry Division is reporting results to the IPM program for incidence of diseases and insects on forest and ornamental trees.

Without the cooperation of our foresters, we could not have collected this statewide pest incidence information.

It is always personally rewarding to work with our foresters and with the public in providing service to all who seek answers to their pest problems.

Cooperation and team effort has always been our key to a successful Forest Pest Management Program.

* * * * *

<u>INSECT-HOST</u>	<u>COUNTY</u>
Aphids - on many plant species	Statewide
Bagworms - on evergreens	Statewide
Black Turpentine Beetle - shortleaf pine	Texas
Borers - in hardwood trees	Andrew, Buchanan, Cape Girardeau, Carter, Clay, Crawford, Greene, Jefferson, Jackson, Johnson, Jasper, Livingston, Oregon, Pulaski, Reynolds, Shannon, St. Louis City & County, St. Charles, Texas, Washington, Wayne
Bronze Birch Borer - on white birch	Statewide
Eastern Tent Caterpillar - on black cherry	Franklin, Maries, Reynolds, St. Louis Co.
Elm Leaf Beetle - on Siberian elm	Statewide
European Pine Sawfly - on Scotch and Mugho pines	Adair, Buchanan, Clay, DeKalb, Franklin, Jackson, Jefferson, Platte, St. Charles, St. Louis
Fall Webworm - on black walnut and other hardwood species	Statewide
Gall Insects - on certain hardwoods	Statewide
Gypsy Moth - in traps	Jefferson, Pulaski, St. Louis County
<u>Ips</u> - shortleaf pine	Texas
Kermes Scale - on post oak	Butler, Franklin, Jefferson, St. Charles, St. Louis City, St. Louis County, St. Francis, Wayne
Loblolly Pine Sawfly - on shortleaf pine	Laclede
Nantucket Pine Tip Moth - on shortleaf and Scotch pines	Boone, Douglas, Perry, St. Louis City
Pales Weevil - on Scotch pine	Adair, Warren
Pine Webworm - on Shortleaf and Scotch pines	Butler, Jefferson, Perry, Ste. Genevieve, Warren
Redheaded Pine Sawfly - on shortleaf pine	Crawford, Laclede
Scale Insects - on hardwoods	Buchanan, Cape Girardeau, Carroll, Jackson, Stoddard, Wayne

Scale Insects - Scotch pine

Greene, Jackson, Jefferson, Marion,
St. Charles, St. Louis City, St. Louis
County

True Tree Grasshopper - on hardwoods

Iron, Reynolds

Two-Lined Chestnut Borer - oak

In counties with stressed oak trees -
Statewide

Walking Stick - oak

very light in south Missouri forests

Walnut Caterpillar - on walnut, pecan and
hickory

Adair, Andrew, Atchison, Buchanan, Cald-
well, Clinton, Cooper, Daviess, DeKalb,
Greene, Grundy, Harrison, Holt, Jackson,
Lafayette, Mercer, New Madrid, Nodaway,
Pike, Worth

* * * * *

PEST AND HOST

COUNTY

Actinopelte Leaf Spot
(pin, black and Northern Red oak)

St. Louis, McDonald, Henry

Air Pollution (Needle Tip Burn)
(Eastern white pine)

St. Louis, Livingston, Clay

Anthracoze (American sycamore)

Perry, Henry, St. Clair, Warren, Butler,
Stoddard, Scott, Mississippi, New Madrid,
Pemiscot, Dunklin, Ripley, Wayne, Maries,
Osage, Pulaski, Phelps, Putnam, Sullivan,
Linn, Schuyler, Adair, Macon, Scotland,
Knox, Saline, Howard, Randolph, Boone,
Audrain, Callaway, Moniteau, Cooper, Cole,
Barry, Barton, Jasper, Lawrence, McDonald,
Newton, Buchanan, Atchison, Holt, Andrew,
Nodaway, Worth, Gentry, Daviess, DeKalb,
Harrison, Clinton, Chariton, Platte,
Caldwell, Mercer, Grundy, Livingston,
Carroll, St. Charles, St. Louis, Jefferson,
St. Louis City, Webster, Polk, Texas,
Douglas, Ozark, Iron, Reynolds, Jackson,
Franklin, Crawford

Anthracoze (silver, red, black, sugar
and Norway Maple)

Buchanan, Atchison, Holt, Andrew, Noda-
way, Worth, Gentry, Daviess, DeKalb,
Harrison, Clinton, Chariton, Platte,
Caldwell, Mercer, Grundy, Livingston,
Carroll, Phelps, Camden, Maries, Osage,
Pulaski, Callaway, St. Charles, St. Louis,
Jefferson, St. Louis City, Cole, Webster,
Polk, Jackson

Anthrachnose (white, pin, Northern red oak)	Marion, Buchanan, St. Louis
Anthrachnose (green ash)	St. Charles, St. Louis, St. Louis City, Callaway, Jackson, Cole
Anthrachnose (black walnut)	Wright, Texas
Apple Scab (crabapple)	Jackson, St. Francois, Camden, Clay, Jackson, Cole, St. Louis
Armillaria Root Rot (Northern red, white, scarlet, and post oak)	Reynolds, Lawrence, Putnam, Sullivan, Linn, Schuyler, Adair, Macon, Scotland, Knox
Ash Decline (green and white ash)	Hickory, Buchanan, St. Louis City, St. Louis, Jefferson, St. Charles, Andrew, Livingston, Wayne
Bacterial Wetwood of Elm (American elm)	Buchanan, St. Louis City, Johnson, Camden, Cole
Bleeding Canker (maple, crabapple, Siberian elm, sweetgum, and English, white, pin, and willow oak)	Jasper, Moniteau, Butler, Ste. Genevieve, Camden, Phelps, Buchanan, Jasper, Gasconade, St. Louis City, St. Louis, Jefferson, St. Charles
Botryodiplodia Canker (pin, white, shingle and English oak)	Buchanan, St. Louis City, Montgomery, St. Louis
Boxwood Leaf Spot (boxwood)	Johnson
Brown-Spot Needle Blight (Scotch pine)	Wright, Texas, St. Charles, St. Louis, Jefferson, St. Louis City, Andrew, Buchanan, Johnson, Boone, Putnam, Sullivan, Linn, Schuyler, Adair, Macon, Scotland, Knox, Newton
Bull's-Eye Leaf Spot (black walnut)	Texas
Cedar-Apple Rust (apple, Eastern red cedar, <u>Juniperus</u> spp.)	Phelps, Marion, Newton, Linn, Stone, Taney, Greene, Jackson, Franklin, Osage, Maries, Putnam, Sullivan, Schuyler, Adair, Macon, Scotland, Knox, Christian, Greene, Marion
Chlorosis (iron deficiency) (sweetgum)	Buchanan, Henry, Franklin, St. Louis City, St. Louis, Jefferson, St. Charles
Chlorosis (iron deficiency) (pin oak)	Greene, Miller, Phelps, St. Louis City, St. Louis, Jefferson, St. Charles, Franklin
Chlorotic Dwarf (Eastern white pine)	St. Louis

Cytospora Canker (weeping willow)

St. Louis

Diplodia Tip Blight (Austrian, Scotch, Ponderosa and red pine)

Cole, Camden, Barton, Andrew, Buchanan, Atchison, Holt, Nodaway, Worth, Gentry, Daviess, DeKalb, Harrison, Clinton, Chariton, Platte, Caldwell, Mercer, Grundy, Livingston, Carroll, Wayne, Jackson, Newton, St. Charles, St. Louis, Jefferson, St. Louis City, Boone, Clay, Osage

Dogwood Leaf Spot (roughleaf dogwood)

Texas

Dothistroma Needle Blight (Austrian pine)

Boone, Benton, Phelps, Adair, Morgan, Cole, St. Louis

Drought Damage (maple, mulberry, ash, dogwood, cottonwood, birch, hackberry, holly, hickory, pecan, Eastern red cedar, black walnut, shortleaf pine, Eastern white pine, Scotch pine, post oak, Northern red oak, white oak, pin oak, black oak)

Barry, Barton, Jasper, Lawrence, McDonald, Newton, Ozark, Douglas, Phelps, Pike, Iron, Reynolds, Carter, Butler, Adair, Cole, Boone, Wayne, St. Louis City, St. Louis, Jefferson, St. Charles, Marion, McDonald, Buchanan, Shannon, Oregon, Platte, Clay, Jackson, Ray, Lafayette, Dunklin, Ripley, Stoddard, Saline, Howard, Randolph, Audrain, Callaway, Moniteau, Cooper, Greene, Christian, Webster, Stone, Taney, Osage, Maries, Gasconade, Franklin, Crawford, Washington, Scott, Mississippi, New Madrid, Pemiscot, Dallas

Dutch Elm Disease (American elm)

Marion, Perry, Greene, Clark, Lewis, Shelby, Monroe, Ralls, Pike, Lincoln, Montgomery, Warren, Iron, Reynolds, Wayne, St. Louis City, St. Louis, Jefferson, St. Charles, Buchanan, Atchison, Holt, Andrew, Nodaway, Worth, Gentry, Daviess, DeKalb, Harrison, Clinton, Chariton, Platte, Caldwell, Mercer, Grundy, Livingston, Carroll, Pulaski, Taney, Vernon, Carter, Butler, Johnson, Crawford, Barton, Jackson, Boone, Stoddard, Scott, Mississippi, New Madrid, Pemiscot, Dunklin, Ripley, Cole

Eastern Gall Rust (Pine-Oak Gall Rust) (shortleaf pine)

Texas, Howell, Douglas, Gasconade, Reynolds, Carter, Wayne, Butler

Elm Phloem Necrosis (American elm)

Carter, Wayne, St. Louis City, St. Louis, Jefferson, St. Charles, Livingston

Fireblight (peach, apple, pear, crabapple)

St. Louis, Texas, Howell, Wayne, Boone, Laclede, Christian, Greene, Reynolds, Jackson, Douglas, Harrison, Greene, Henry, Buchanan, Andrew, Cass, Howell

Frost Crack (linden)

Frost Damage (pin oak, maple, sweetgum, mimosa)

Fusarium Canker (black walnut)

Hail Damage (miscellaneous species)

Heat Scorch
(cherry, ash, dogwood, maple, birch, sweetgum, ginkgo, pin oak, black oak, white oak, sugar maple, weeping willow)

Herbicide Injury
(magnolia, redbud, Austrian pine, ash, black cherry, Eastern white pine, walnut, sweetgum, plum, elm, maple, birch, dawn redwood, sugar maple, bur oak, dogwood, shingle oak, pear, American elm)

Hypoxyton Canker
(Northern red, pin, white, black and willow oak)

Ice, Heavy Snow and Wind
(Eastern red cedar, silver maple, Siberian elm, green ash, shortleaf pine, birch)

Kabatina Blight
(Eastern red cedar)

Lightning Injury
(black walnut, pin oak, black oak, sugar maple)

Maple Decline
(Norway, sugar and red maple)

Maple Leaf Blister
(sugar maple)

Melampsora Leaf Rust
(cottonwood)

Naemacyclus Needlecast
(Scotch pine)

Nectria cinnabarina canker
(Bradford pear, mimosa)

Johnson

Buchanan, Jackson, Clay, Butler, Stoddard, Scott, Mississippi, New Madrid, Pemiscot, Dunklin, Ripley

Holt, Adair, Stoddard

Adair, Macon, Sullivan, Lawrence

Livingston, St. Louis, St. Louis City, Jefferson, St. Charles, Douglas, Texas, Laclede, Buchanan, Putnam, Henry, Andrew, Jackson, Marion, Clinton

Jackson, Texas, Cole, St. Louis, Wayne, Boone, Howard, Shannon, Buchanan, Perry, Laclede, Crawford, Audrain, Bates, Butler, Caldwell, Callaway, Shannon

Cole, Carter, Wayne, St. Louis City, St. Louis, St. Charles, Jefferson, Morgan, Platte, Scott, Barry, Cass

Gasconade, Franklin, Crawford, Washington, Jefferson, Buchanan, Camden, Miller, Morgan, Platte, Clay, Jackson, Ray, Lafayette, Dallas, Hickory, Laclede

Linn

Butler, Bollinger, Jackson, Boone, Andrew

Jackson, Franklin, Greene, Buchanan, Lawrence, Reynolds, Laclede, St. Francois, Carter, Wayne, Andrew, Bollinger, Adair, St. Louis City, St. Louis, Jefferson, St. Charles

St. Francois, Miller, Marion, Cole

Texas

Maries, Greene, St. Louis, Johnson, St. Louis City

Cole, St. Louis

Oak Decline (white, post, red, black, black jack, pin and Northern red oak)	Oregon, Shannon, Osage, Maries, Barton, Lawrence, McDonald, Newton, Texas, Butler, Johnson, Putnam, Sullivan, Linn, Schuyler, Adair, Macon, Scotland, Knox, Iron, Reynolds, Carter, St. Louis City, Gasconade, St. Louis, Taney, Madison, Cole, Morgan, Barry, Jasper
Oak Leaf Blister (white, pin, and Northern red oak)	St. Louis City, St. Louis, Jefferson, St. Charles, Franklin, Wayne, St. Francois
Oak Wilt (black, shingle, pin, white and Northern red oak)	Lafayette, St. Louis, Warren, Henry, Cedar, DeKalb, St. Louis City, Marion, Crawford, Barton, Buchanan, Clinton, Moniteau, Daviess, Boone, Iron, Reynolds, Ray, Perry, Linn, Clay, Clark, Lewis, Shelby, Monroe, Ralls, Pike, Lincoln, Montgomery, Cass, Platte, Jackson
Peach Leaf Curl (peach)	Camden, Shannon
Pestalotia Blight (yew)	Jackson
Phomopsis Blight (Eastern red cedar, <u>Juniperus</u> spp.)	Crawford, Phelps, Cole, Buchanan, Reynolds, Clinton, St. Louis, St. Charles, Jefferson, Boone, St. Louis City, Jackson
Maple Leaf Spot (<u>Phyllosticta</u> sp.) (sugar maple)	Greene
Pine Wilt Disease (Scotch pine)	Crawford, Boone, Franklin, Wayne, Gasconade, Boone, Jasper, Cole, St. Louis
Powdery Mildew (pin oak)	Jackson
Pyrenochaeta Twig Blight (shingle and pin oak)	St. Louis
Quince Rust (Eastern red cedar)	Osage, Pulaski
Rhizosphaera Needlecast (Colorado blue and white spruce)	St. Louis, Franklin, Iron, Henry, Bu- chanan, Livingston, Putnam, Sullivan, Linn, Schuyler, Adair, Macon, Scotland, Knox, McDonald, St. Francois, Jackson, Wayne, Greene, Andrew, Camden
Sapsucker Injury (shortleaf pine, tulip poplar, Scotch pine, pecan, Eastern white pine, pin oak, Austrian pine, crabapple, sugar maple, sweetgum, ash)	Pulaski, Marion, Gasconade, Carter, Wayne, Butler, Bates, Jackson, Phelps, Clinton, Greene, Cass, Reynolds, Franklin, Boone, Buchanan, St. Louis, St. Louis City, Jefferson, St. Charles, Johnson, Andrew, Jasper, Osage, Platte, Clay, Iron, Cole

Steganosporium Canker
(sugar maple)

Sunscauld Injury
(maple, yellow poplar, black walnut)

Tar Spot (silver maple)

Verticillium Wilt
(sugar maple, catalpa, elm, tulip
poplar, European linden)

Winter Burn and Winter Drying
(Eastern red cedar, Juniperus spp.,
holly, arborvitae, various ornamentals
and shortleaf, loblolly, Eastern white,
Scotch, Austrian and jack pine)

Winter Injury and Winter Kill
(mimosa, boxwood, holly, arborvitae, mag-
nolia, cedar, ornamental shrubs)

Witches' Broom
(hackberry)

Maries, St. Louis

Greene, Clark, Bollinger

Perry, Laclede, Butler, Henry

Gentry, Buchanan, DeKalb, Osage, Greene,
Boone, Andrew, Barry, Bollinger,
St. Louis, Warren, Jackson, Cooper

Buchanan, Henry, Oregon, Franklin, Cedar,
Christian, Dade, Greene, Polk, Stone,
Taney, Webster, St. Clair, Camden,
Morgan, Dallas, Hickory, Laclede, Miller,
Boone, Moniteau, Cole, Clay, Jackson,
Carter, Iron, Reynolds, Wayne, Butler,
Grundy, Maries, Osage, Phelps, Pulaski,
Bollinger, Cape Girardeau, Madison, Perry,
St. Francois, Ste. Genevieve, Andrew,
Atchison, Caldwell, Carroll, Chariton,
Clinton, Daviess, DeKalb, Gentry,
Harrison, Holt, Livingston, Mercer, Noda-
way, Worth, Callaway, Cooper, Texas,
Douglas, Jefferson, St. Charles, St.
Louis, St. Louis City, Barry, Barton,
Jasper, Lawrence, Marion

Henry, Cole, Barry, Barton, Newton,
Jasper, Lawrence, McDonald, Perry, Phelps,
Wright, Texas, Douglas, Howell, Ozark

Cass

Forest Pest Management
Missouri Department of Conservation
P.O. Box 180
Jefferson City, MO 65102

PHONE: 314/751-4115

BULK RATE
U. S. POSTAGE
PAID
Jefferson City, Mo.
Permit No. 274